OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **SUNRISE LAKE** the program coordinators recommend the following actions. *The following observations are based on a limited set of data in the past four years. We recommend increasing sampling frequency if possible, to improve the accuracy of our analyses.*

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show the in-lake chlorophyll-a concentration tends to be *worsening*, meaning concentrations are increasing. However, it is difficult to analyze a trend with only one set of data collected per summer. This year's reading was above the New Hampshire mean reference line and there was a large increase in chlorophyll-a concentration from 1999. Spring rain may have washed excess nutrients into the lake, which caused an increase in algal growth. While algae are present in all lakes, an excess amount of any type is not welcomed. Though phosphorus concentrations decreased this year in the lake, these concentrations were evidently sufficient to support an increase in algal abundance. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows lake transparency has *declined* since 1997. Water clarity decreased this season most likely as a result of the increase in chlorophyll-a concentrations. The transparency at Sunrise Lake remains below the New Hampshire mean. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake); the upper graph shows current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. The lower graph shows a *generally stable* trend for in-lake phosphorus levels. Phosphorus concentrations decreased this season and were the lowest the lake has experienced in the four years since monitoring began. Maintaining phosphorus concentrations at this level is desirable for Sunrise Lake. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- Conductivity levels of Hampshire Bk and Tanglewood Bk were lower in 2000 than in 1999 (Table 6). The rains throughout the summer likely helped to dilute and flush any pollutants from these streams. The watershed of Sunrise Lake continues to have very low conductivity results, which indicates there are little impacts associated with human-made pollutants.

- Tanglewood Bk has had fluctuating total phosphorus results since 1997 (Table 8). This year's concentration was much lower than that in 1999. We greatly encourage the association to conduct more sampling events in the future. Typically, we ask associations to conduct one sampling event per summer month. The more data we have the easier it is for us to understand the overall health of your watershed. We strongly recommend increased sampling to help us understand the increase in algal abundance that has been taking place.

- The dissolved oxygen was high throughout the water column in June (Table 9). Shallow lakes typically mix continuously throughout the summer by wind and wave action, which allows for oxygen exchange with the atmosphere.

- *E. coli* originates in the intestines of warm-blooded animals (including humans) and is an indicator of associated and potentially harmful pathogens. Bacteria concentrations were low at the sites tested (Table 12). If residents are concerned about septic system impacts, testing when the water table is high or after rains is best. Please consult the Other Monitoring Parameters section of the report for the current standards for *E. coli* in surface waters.

USEFUL RESOURCES

Proper Lawn Care Can Protect Waters, WD-BB-31, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

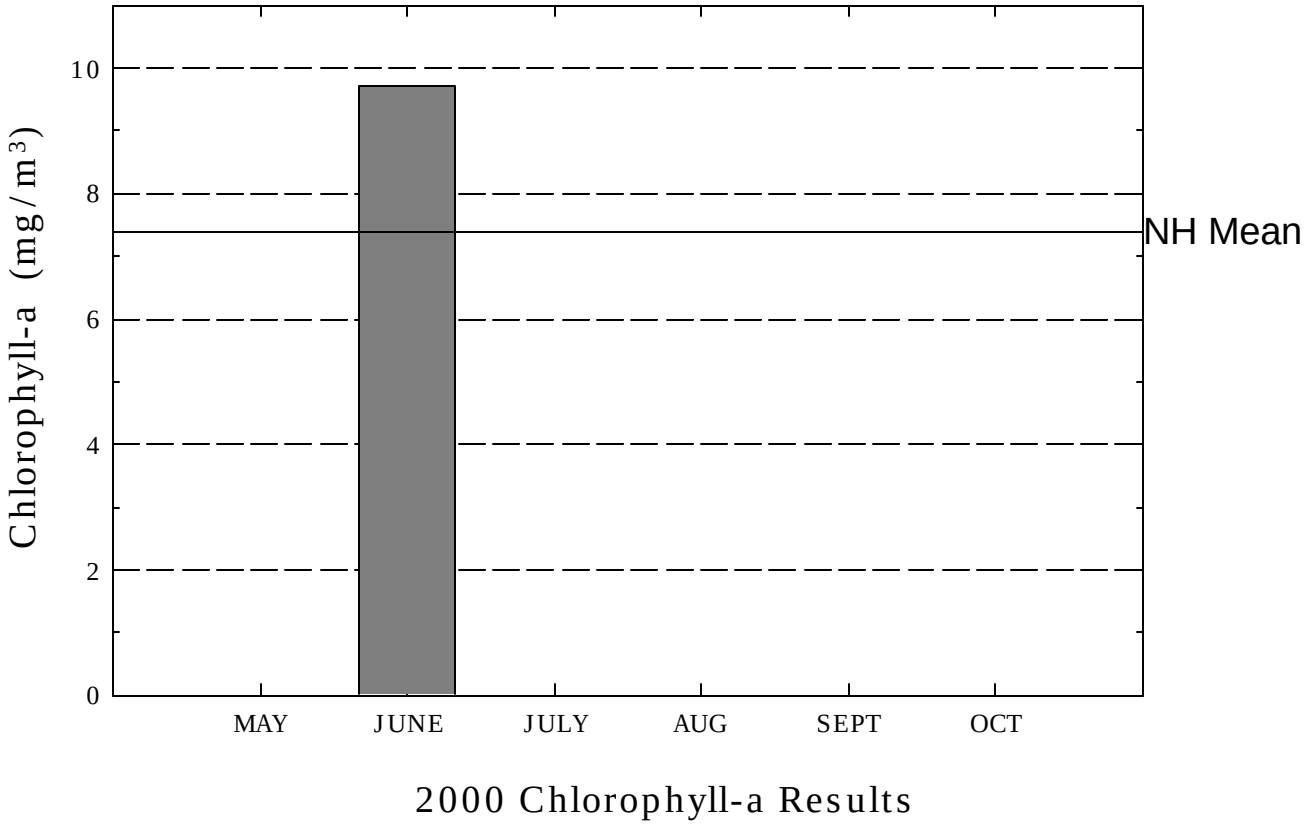
Effects of Phosphorus on New Hampshire's Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Anthropogenic Phosphorus and New Hampshire Waterbodies, NHDES-WSPCD-95-6, NHDES Booklet, (603) 271-3503

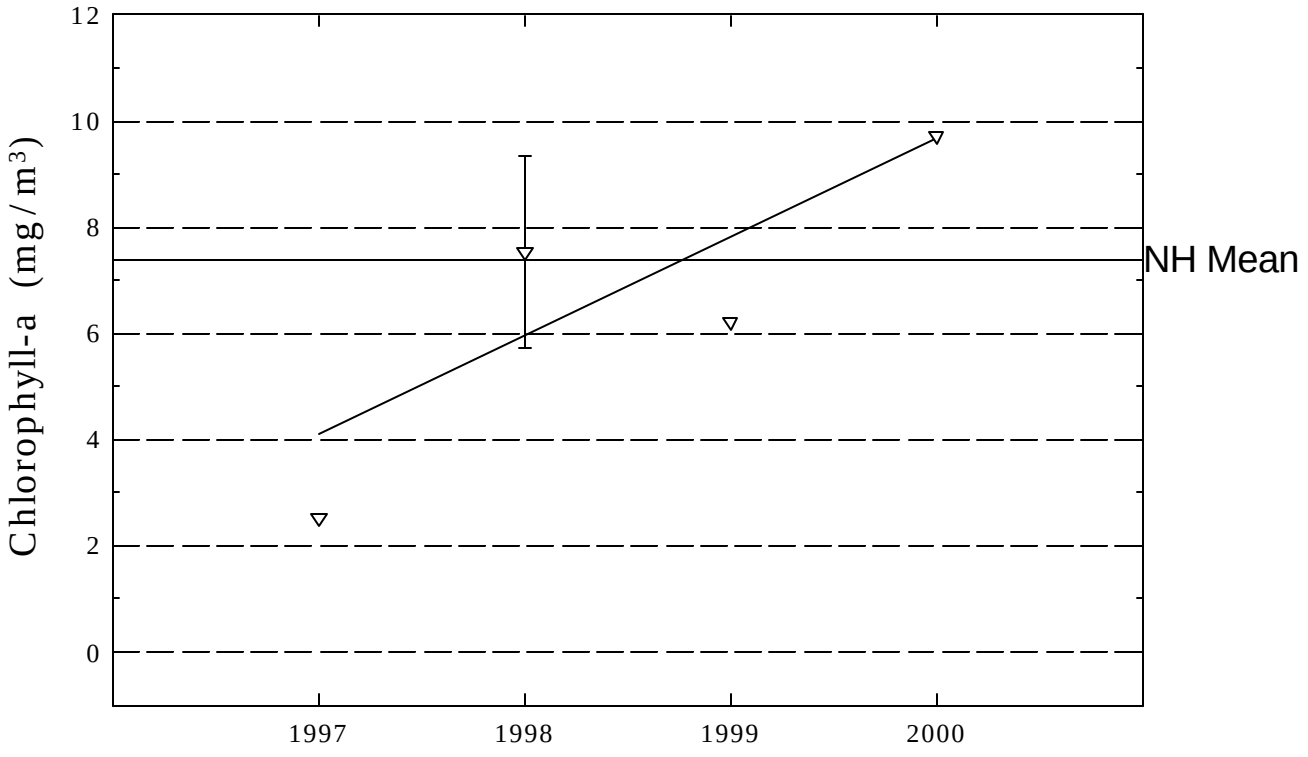
Aquatic Plants and Their Role in Lake Ecology, WD-BB-44, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Sunrise Lake

Figure 1. Monthly and Historical Chlorophyll-a Results



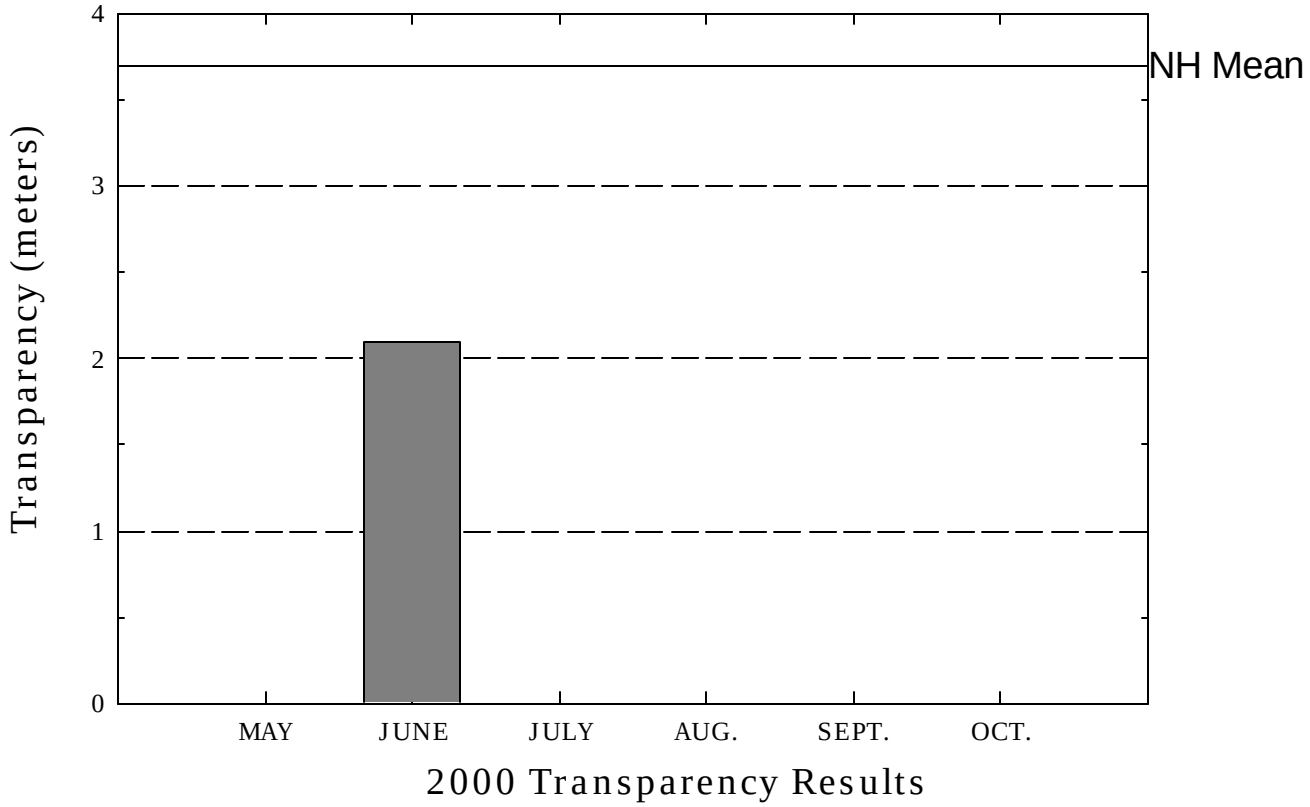
2000 Chlorophyll-a Results

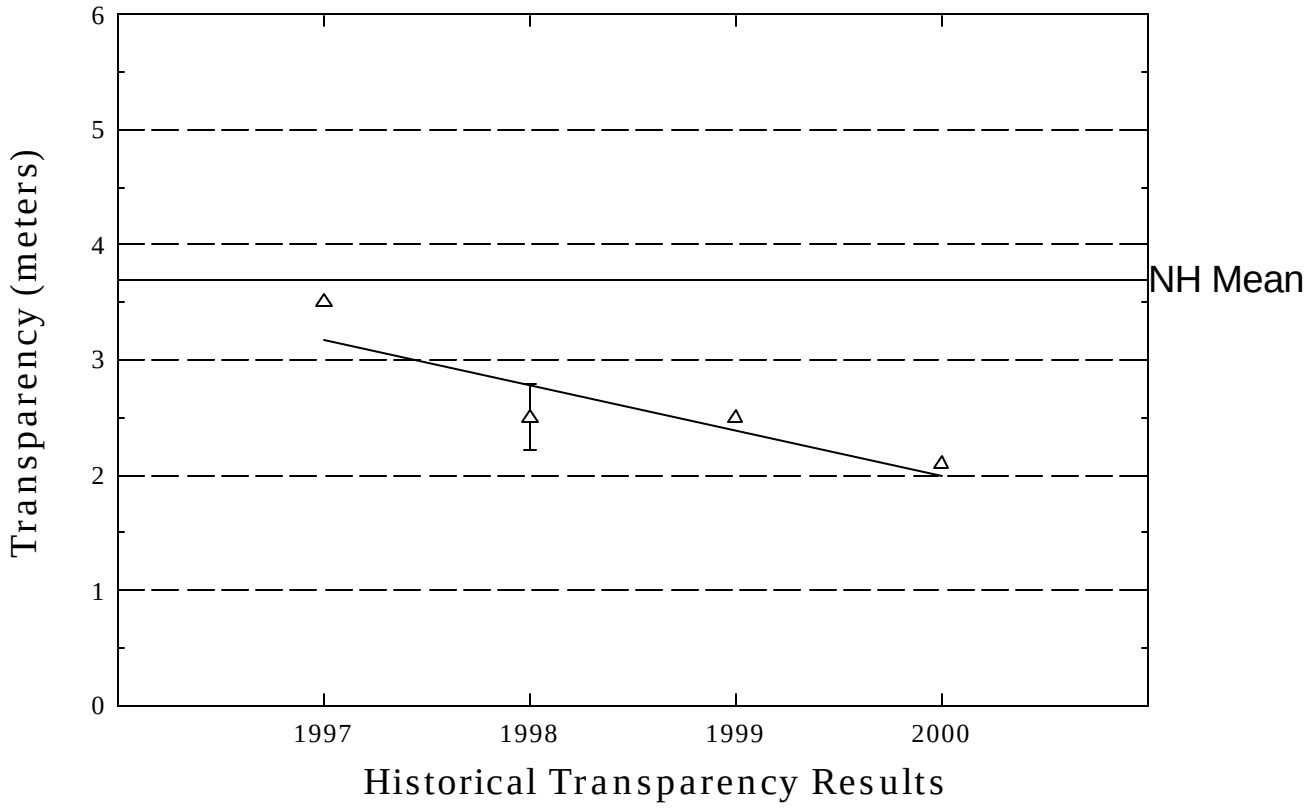


Historical Chlorophyll-a Results

Sunrise Lake

Figure 2. Monthly and Historical Transparency Results





Sunrise Lake

Figure 3. Monthly and Historical Total Phosphorus Data.

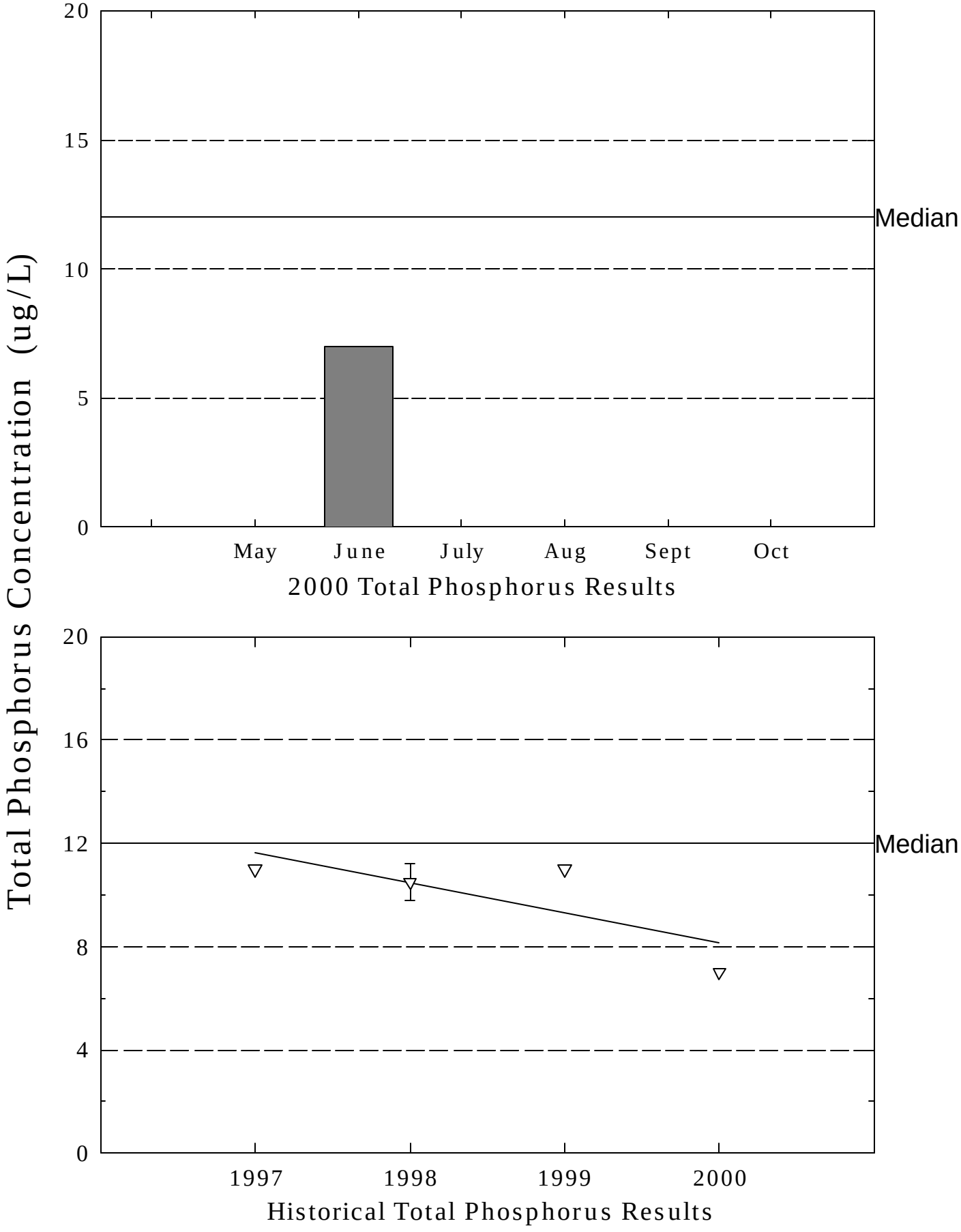


Table 1.

SUNRISE LAKE

MIDDLETON

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1997	2.54	2.54	2.54
1998	6.26	8.80	7.53
1999	6.21	6.21	6.21
2000	9.72	9.72	9.72

Table 2.

SUNRISE LAKE

MIDDLETON

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
06/25/1997	CHRYSOSPHAERELLA	35
	DINOBRYON	28
	ASTERIONELLA	12
06/29/1998	UROGLENOPSIS	47
	DINOBRYON	21
	ASTERIONELLA	18
07/15/1999	RHIZOSOLENIA	72
	CHRYSOSPHAERELLA	6
	ARTHRODESMUS	5
06/20/2000	DINOBRYON	44
	RHIZOSOLENIA	44
	MALLOMONAS	9

Table 3.

SUNRISE LAKE

MIDDLETON

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1997	3.5	3.5	3.5
1998	2.3	2.7	2.5
1999	2.5	2.5	2.5
2000	2.1	2.1	2.1

Table 4.

SUNRISE LAKE

MIDDLETON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	6.96	6.96	6.96
	1998	6.46	6.68	6.56
	1999	6.70	6.70	6.70
	2000	6.77	6.77	6.77
HAMPSHIRE BK				
	1997	5.99	5.99	5.99
	1998	6.01	6.16	6.08
	1999	6.62	6.62	6.62
	2000	6.17	6.17	6.17
TANGLEWOOD BK				
	1997	6.26	6.26	6.26
	1998	6.01	6.11	6.06
	1999	6.52	6.52	6.52
	2000	6.33	6.33	6.33

Table 5.

SUNRISE LAKE

MIDDLETON

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1997	3.50	3.50	3.50
1998	3.20	4.10	3.65
1999	4.20	4.20	4.20
2000	3.80	3.80	3.80

Table 6.

SUNRISE LAKE
MIDDLETON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	33.5	33.5	33.5
	1998	34.0	36.3	35.1
	1999	44.5	44.5	44.5
	2000	44.4	44.4	44.4
HAMPSHIRE BK				
	1997	32.1	32.1	32.1
	1998	28.6	32.9	30.7
	1999	45.8	45.8	45.8
	2000	37.1	37.1	37.1
TANGLEWOOD BK				
	1997	34.7	34.7	34.7
	1998	23.5	30.0	26.7
	1999	39.7	39.7	39.7
	2000	31.4	31.4	31.4

Table 8.

SUNRISE LAKE

MIDDLETON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	11	11	11
	1998	10	11	10
	1999	11	11	11
	2000	7	7	7
HAMPSHIRE BK				
	1997	16	16	16
	1998	6	10	8
	1999	7	7	7
	2000	7	7	7
TANGLEWOOD BK				
	1997	40	40	40
	1998	12	22	17
	1999	33	33	33
	2000	10	10	10

Table 9.

SUNRISE LAKE

MIDDLETON

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		June 20, 2000	
0.1	20.9	8.5	95.2
1.0	20.7	8.5	95.0
2.0	19.2	6.7	72.3
3.0	17.8	4.3	44.9

Table 10.

SUNRISE LAKE

MIDDLETON

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 25, 1997	2.8	23.0	8.3	96.0
July 15, 1999	3.0	22.8	8.1	92.0
June 20, 2000	3.0	17.8	4.3	44.9

Table 11.

SUNRISE LAKE
MIDDLETON

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	0.5	0.5	0.5
	1998	0.7	2.0	1.3
	1999	0.9	0.9	0.9
	2000	0.8	0.8	0.8
HAMPSHIRE BK				
	1997	0.2	0.2	0.2
	1998	0.1	3.4	1.7
	1999	1.0	1.0	1.0
	2000	0.1	0.1	0.1
TANGLEWOOD BK				
	1997	1.7	1.7	1.7
	1998	0.6	2.9	1.7
	1999	2.9	2.9	2.9
	2000	0.8	0.8	0.8

Table 12.

SUNRISE LAKE

MIDDLETON

Summary of current year bacteria sampling.
Results in counts per 100ml.

Location	Date	E. Coli See Note Below
BARTLETTS COVE		
	June 20	27
BEACH 2 ESTATES		
	June 20	1
HAMPSHIRE SHORES		
	June 20	5
MAIN BEACH		
	June 20	8
TANGLEWOOD BK		
	June 20	39
TOWN BEACH		
	June 20	8

NOTE: "<" means "less than" and ">" means "greater than"